CLAIMS:

1. A two-stage laser pulse energy control device, comprising:

a two-stage laser which is comprised of:

an optical oscillation stage which has an oscillating chamber having laser gas sealed therein and a pair of mutually opposed electrodes disposed therein, and an oscillating high-voltage pulse generator for applying a high-voltage pulse to the pair of electrodes in the oscillating chamber by performing pulse compression of energy charged in an oscillating capacitor in order to excite the laser gas in the oscillating chamber, and which outputs seed light, and

an optical amplification stage which has an amplifying chamber having laser gas sealed therein and a pair of mutually opposed electrodes disposed therein and the seed light being injected therein, and an amplifying high-voltage pulse generator for applying a high-voltage pulse to the pair of electrodes in the amplifying chamber by performing pulse compression of energy charged in an amplifying capacitor in order to amplify the seed light, and which outputs a laser beam obtained from amplifying the seed light; and

a monitor module which measures a pulse energy Pamp of the laser beam, and controlling the pulse energy Pamp of the laser beam, wherein:

the optical oscillation stage and the optical amplification stage are controlled according to a measured result of the monitor module so that the pulse energy Pamp of the laser beam becomes a target energy Patgt of the optical amplification stage.

2. A two-stage laser pulse energy control device, comprising:

a two-stage laser which is comprised of:

an optical oscillation stage which has an oscillating chamber having laser gas sealed therein and a pair of mutually opposed electrodes disposed therein, and an oscillating high-voltage pulse generator for applying a high-voltage pulse to the pair of electrodes in the oscillating chamber by performing pulse compression of energy charged

in an oscillating capacitor in order to excite the laser gas in the oscillating chamber, and which outputs seed light, and

an optical amplification stage which has an amplifying chamber having laser gas sealed therein and a pair of mutually opposed electrodes disposed therein and the seed light being injected therein, and an amplifying high-voltage pulse generator for applying a high-voltage pulse to the pair of electrodes in the amplifying chamber by performing pulse compression of energy charged in an amplifying capacitor in order to amplify the seed light, and which outputs a laser beam obtained from amplifying the seed light;

a first monitor module which measures a pulse energy Posc of the seed light; and

a second monitor module which measures a pulse energy Pamp of the laser beam, and

controlling the pulse energy Pamp of the laser beam, wherein:

the optical oscillation stage is controlled according to a measured result of the first monitor module so that the pulse energy Posc of the seed light becomes a prescribed energy Es0 or more,

the optical amplification stage is controlled according to a measured result of the second monitor module so that the pulse energy Pamp of the laser beam becomes a target energy Patgt of the optical amplification stage, and

the prescribed energy Es0 is set in an amplification saturation region such that a change ratio of the pulse energy Pamp of the laser beam associated with a change of the pulse energy Posc of the seed light becomes a prescribed value or less.

3. The two-stage laser pulse energy control device according to claim 2, wherein the control in the optical oscillation stage controls a charging voltage Vosc applied to the oscillating capacitor, and the control in the optical amplification stage controls a charging voltage Vamp applied to the amplifying capacitor.

4. The two-stage laser pulse energy control device according to claim 2, wherein:

the control in the optical oscillation stage controls at least one of a laser gas pressure and a laser gas composition in the oscillating chamber in addition to a control of a charging voltage Vosc applied to the oscillating capacitor, and

the control in the optical amplification stage controls at least one of a laser gas pressure and a laser gas composition in the amplifying chamber in addition to a control of the charging voltage Vamp applied to the amplifying capacitor.

5. The two-stage laser pulse energy control device according to claim 3 or 4, wherein the charging voltage Vosc applied to the oscillating capacitor is nearly matched with the charging voltage Vamp applied to the amplifying capacitor.

6. The two-stage laser pulse energy control device according to claim 3 or 4, wherein a change ratio of the charging voltage Vosc applied to the oscillating capacitor is nearly matched with a change ratio of the charging voltage Vamp applied to the amplifying capacitor.

7. The two-stage laser pulse energy control device according to claim 3 or 4, wherein a change amount of the charging voltage Vosc applied to the oscillating capacitor is nearly matched with a change amount of the charging voltage Vamp applied to the amplifying capacitor.

8. A two-stage laser pulse energy control device, comprising:

a two-stage laser which is comprised of:

an optical oscillation stage which has an oscillating chamber having laser gas sealed therein and a pair of mutually opposed electrodes disposed therein, and an oscillating high-voltage pulse generator for applying a high-voltage pulse to the pair of electrodes in the oscillating chamber by performing pulse compression of energy charged

in an oscillating capacitor in order to excite the laser gas in the oscillating chamber, and which outputs seed light, and

an optical amplification stage which has an amplifying chamber having laser gas sealed therein and a pair of mutually opposed electrodes disposed therein and the seed light being injected therein, and an amplifying high-voltage pulse generator for applying a high-voltage pulse to the pair of electrodes in the amplifying chamber by performing pulse compression of energy charged in an amplifying capacitor in order to amplify the seed light, and which outputs a laser beam obtained from amplifying the seed light;

a monitor module which measures a pulse energy Pamp of the laser beam, and

controlling the pulse energy Pamp of the laser beam, wherein:

the optical oscillation stage is controlled according to a measured result of the monitor module so that the pulse energy Pamp of the laser beam becomes a target energy Patgt of the optical amplification stage, and

the target energy Patgt is set to fall in a region such that a change ratio of the pulse energy Pamp of the laser beam associated with a change of a pulse energy Posc of the seed light becomes a prescribed value or more.

9. The two-stage laser pulse energy control device according to claim 8, wherein the optical amplification stage is controlled when the pulse energy Pamp of the laser beam does not become the target energy Patgt of the optical amplification stage even if the optical oscillation stage is controlled.

10. The two-stage laser pulse energy control device according to claim 8, wherein the control in the optical oscillation stage controls a charging voltage Vosc applied to the oscillating capacitor.

11. The two-stage laser pulse energy control device according to claim 8, wherein the

control in the optical oscillation stage controls at least one of laser gas pressure and laser gas composition in the oscillating chamber in addition to a control of a charging voltage Vosc applied to the oscillating capacitor.

12. The two-stage laser pulse energy control device according to claim 9, wherein:

the control in the optical oscillation stage controls a charging voltage Vosc applied to the oscillating capacitor, and ,

the control in the optical amplification stage controls a charging voltage Vamp applied to the amplifying capacitor.

13. The two-stage laser pulse energy control device according to claim 9, wherein:

the control in the optical oscillation stage controls at least one of laser gas pressure and laser gas composition in the oscillating chamber in addition to a control of a charging voltage Vosc applied to the oscillating capacitor, and

the control in the optical amplification stage controls at least one of laser gas pressure and laser gas composition in the amplifying chamber in addition to a control of a charging voltage Vamp applied to the amplifying capacitor.

14. A two-stage laser pulse energy control device, comprising:

a two-stage laser which is comprised of:

an optical oscillation stage which has an oscillating chamber having laser gas sealed therein and a pair of mutually opposed electrodes disposed therein, and an oscillating high-voltage pulse generator for applying a high-voltage pulse to the pair of electrodes in the oscillating chamber by performing pulse compression of energy charged in an oscillating capacitor in order to excite the laser gas in the oscillating chamber, and which outputs seed light, and

an optical amplification stage which has an amplifying chamber having laser gas sealed therein and a pair of mutually opposed electrodes disposed therein and the

seed light being injected therein, and an amplifying high-voltage pulse generator for applying a high-voltage pulse to the pair of electrodes in the amplifying chamber by performing pulse compression of energy charged in an amplifying capacitor in order to amplify the seed light, and which outputs a laser beam obtained from amplifying the seed light;

a first monitor module which measures a pulse energy Posc of the seed light; and

a second monitor module which measures a pulse energy Pamp of the laser beam, and

controlling the pulse energy Pamp of the laser beam, wherein:

the optical oscillation stage is controlled according to a measured result of the first monitor module so that the pulse energy Posc of the seed light becomes a target energy Potgt of the optical oscillation stage, and

the optical amplification stage is controlled according to a measured result of the second monitor module so that the pulse energy Pamp of the laser beam becomes a target energy Patgt of the optical amplification stage.

15. The two-stage laser pulse energy control device according to claim 14, wherein the control in the optical oscillation stage controls a charging voltage Vosc applied to the oscillating capacitor, and the control in the optical amplification stage controls a charging voltage Vamp applied to the amplifying capacitor.

16. The two-stage laser pulse energy control device according to claim 14, wherein:

the control in the optical oscillation stage controls at least one of laser gas pressure and laser gas composition in the oscillating chamber in addition to a control of a charging voltage Vosc applied to the oscillating capacitor, and

the control in the optical amplification stage controls at least one of laser gas pressure and laser gas composition in the amplifying chamber in addition to a control of a charging voltage Vamp applied to the amplifying capacitor.

17. A two-stage laser system, comprising:

the two-stage laser pulse energy control device according to claims 1 through 16, and

an exposure device which exposes an object of light exposure using a laser beam.

18. The two-stage laser system according to claim 17, wherein the two-stage laser is any of a KrF laser, an ArF laser and a molecular fluorine laser.